

A Tale of Two Modes in Santa Monica

Pedestrian Scrambles in Action

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Orange County Traffic Engineering Council
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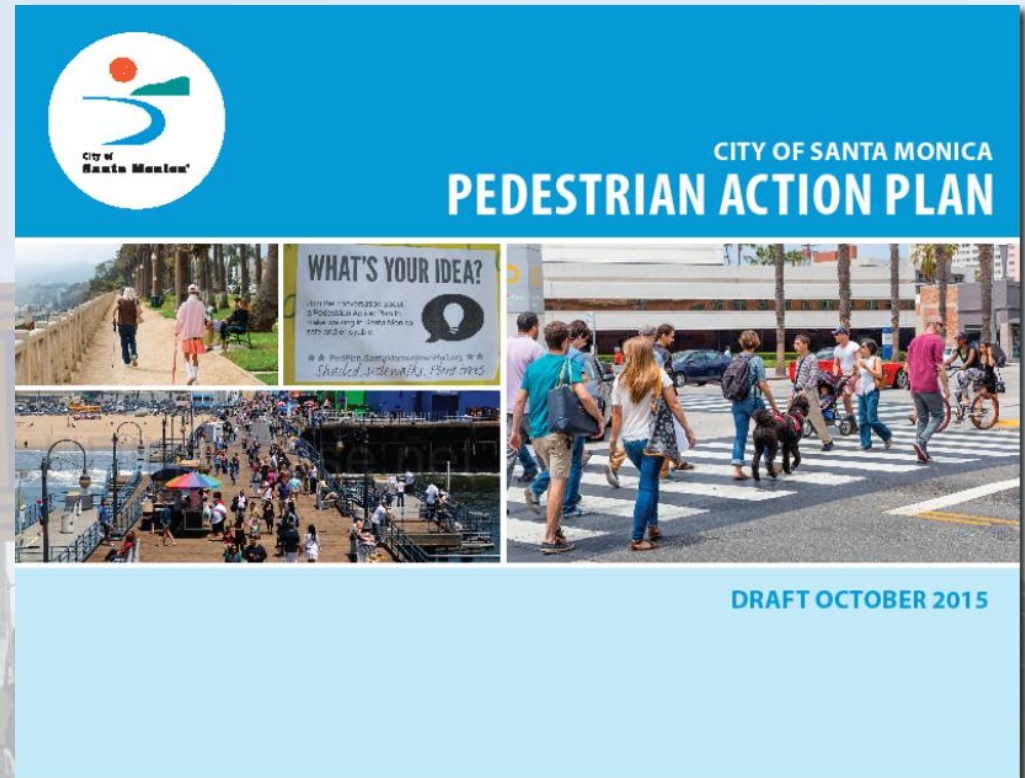


Presentation Outline

- I. Pedestrian Scramble Project
- II. Scramble Safety Analysis
- III. Downtown Timing Study
- IV. Signal Timing Study Findings
- V. Project Summary

Pedestrian Scrambles on the Radar

- ❖ Santa Monica Pedestrian Action Plan
 - Walking core part of City's identity
 - Prioritize walking
 - Vehicle flow tradeoff for safety
 - Vision Zero
 - Designs that promote safety and minimize risk
 - Identifies innovative strategies
 - Pedestrian scrambles



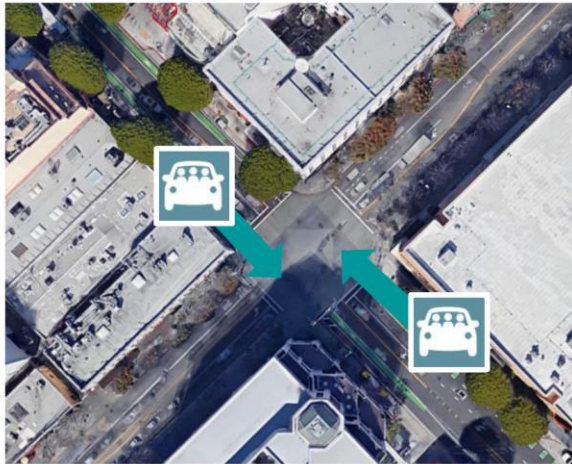
Pedestrian Scrambles

- ❖ Exclusive pedestrian phase
 - All traffic is stopped
 - Peds cross in all directions, including diagonally
- ❖ > 1,200 peds/day
 - Significant collision reduction
- ❖ Safety Countermeasure
 - 70% ped collisions are violation of driver
 - -45% ped/vehicle crash rate
- ❖ Higher delay for peds and other modes



Scramble Intersection Operation

Phase 1



Phase 2



Phase 3



Scramble Intersection Operation: Vehicle and pedestrian signal phases are completely separated

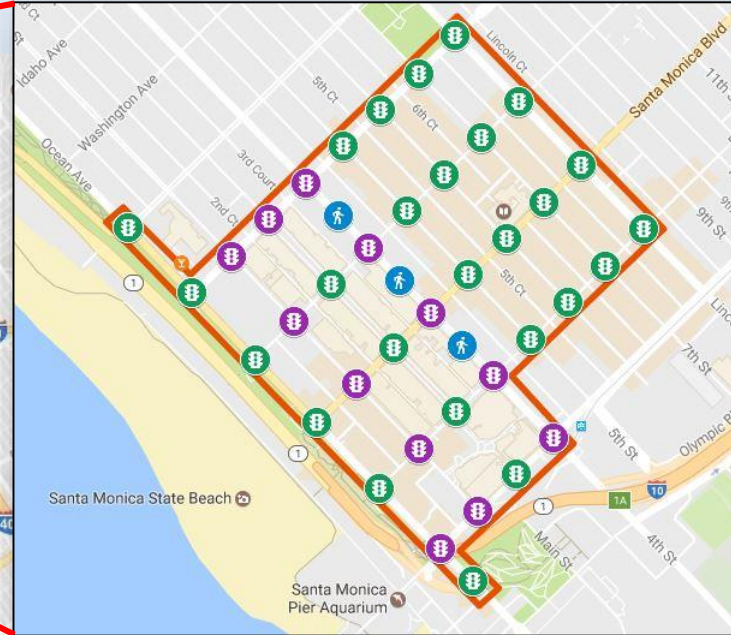
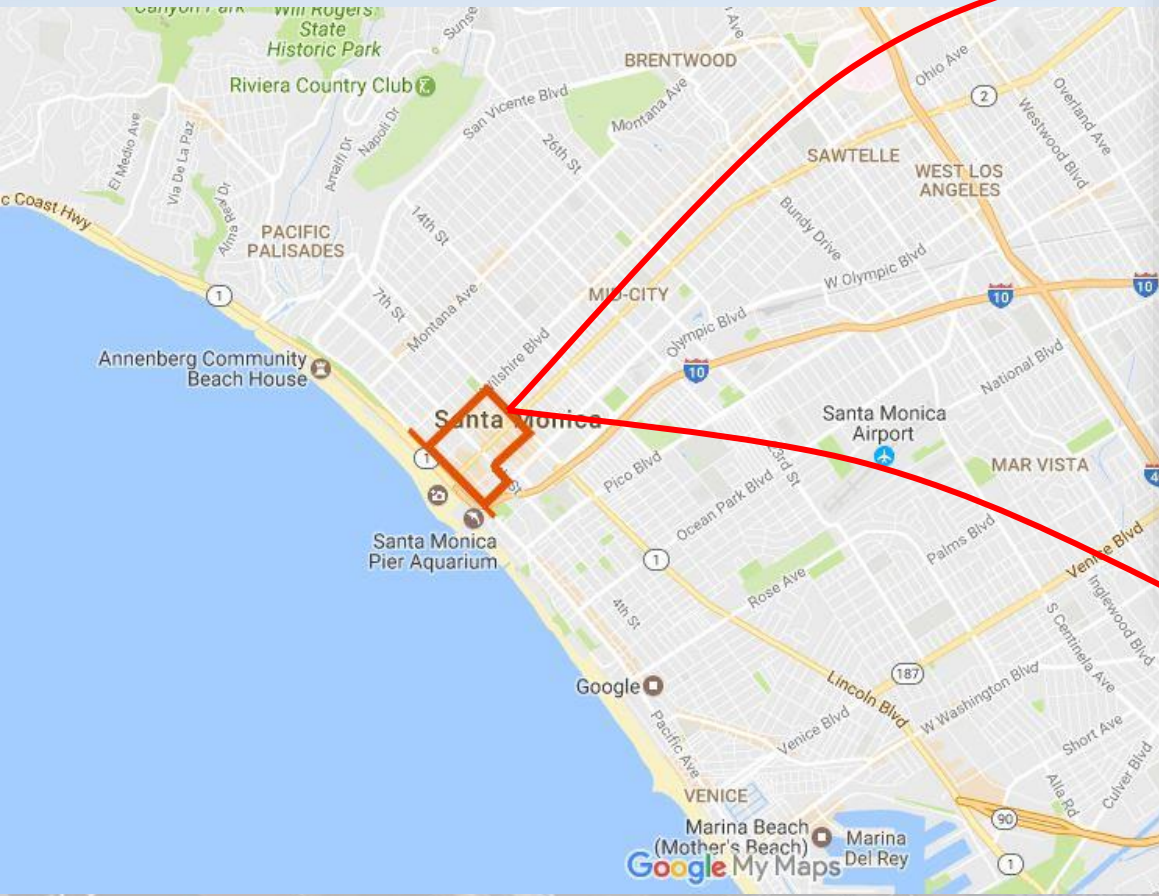
Downtown Ped Scramble Project

❖ Project objectives

1. Establish network of 12 scramble intersections in the City's Downtown area
 - Reduce conflicts between pedestrians and vehicles
 - Reinforce 'Pedestrian First' Downtown
2. Retime 41 Downtown traffic signal grid to accommodate scrambles



Project Location Map

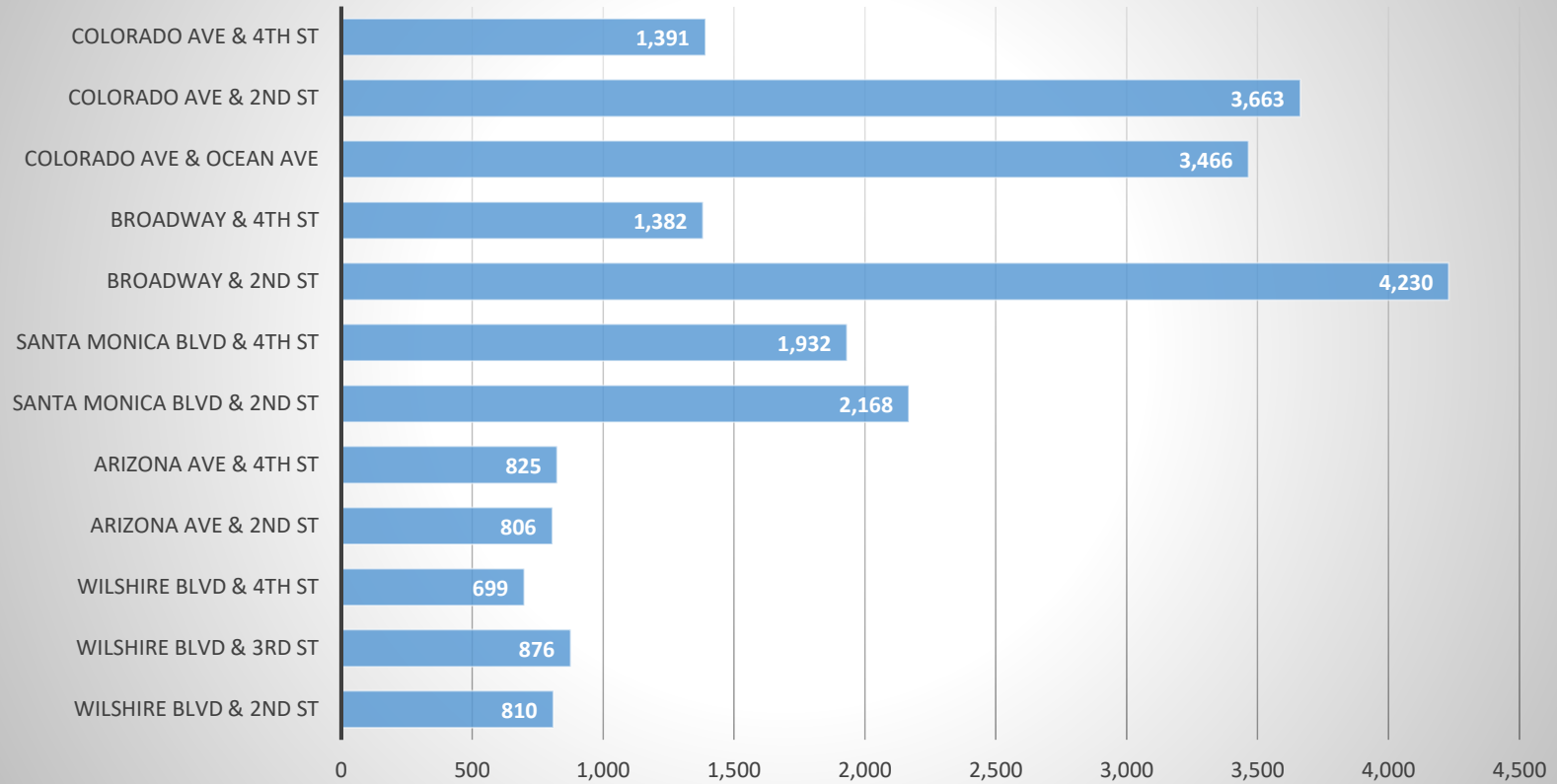


24-Hour Pedestrian Volumes

	Scramble Locations 24 Hour Pedestrian Volume	
	August 2016 Weekend	Oct 2016 Weekday
Wilshire Blvd & 2nd Street	11,664	8,560
Wilshire Blvd & 3rd Street	11,441	9,020
Wilshire Blvd & 4th Street	10,142	9,218
Arizona Ave & 2nd Street	12,187	6,300
Arizona Ave & 4th St	13,885	7,886
Santa Monica Blvd & 2nd St	22,806	11,569
Santa Monica Blvd & 4th St	22,475	13,391
Broadway & 2nd St	38,133	13,928
Broadway & 4th St	16,084	11,181
Colorado Ave & Ocean Ave	64,068	18,269
Colorado Ave & 2nd St	37,602	10,972
Colorado Ave & 4th St	21,574	12,549

Peak-Hour Pedestrian Volumes

Saturday Peak-Hour Pedestrian Volume (July 2017)



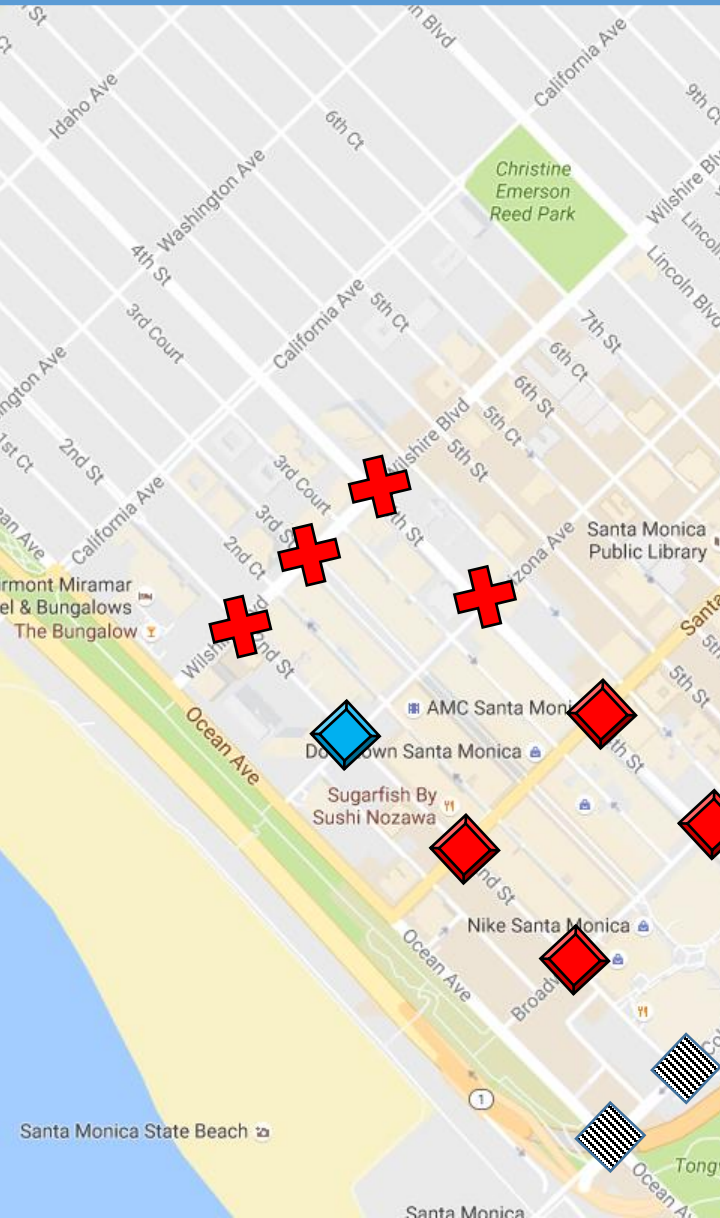
Santa Monica 2038?




Scramble Safety Analysis

- ❖ Intersection Markings
- ❖ Illegal Crossings
- ❖ Incidents
- ❖ Operational Considerations

Intersection Markings



 X Markings



 Full Markings



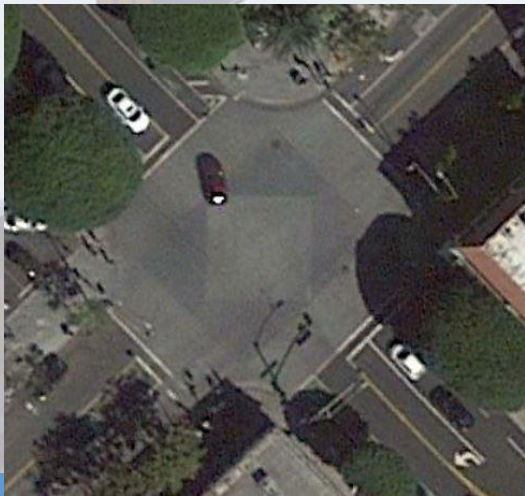
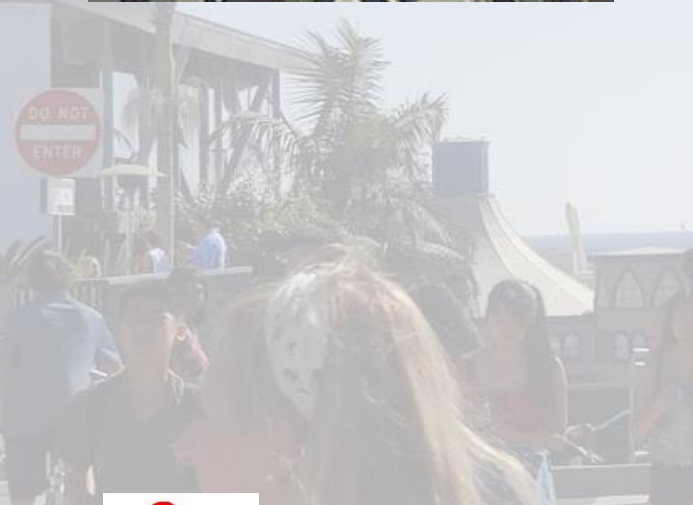
 Colored Artwork



 Special Pavement



Intersection Markings – Aerial View



Scramble Markings – Revised

Original

As of Jan 16, 2018



Illegal Crossings

Intersection	Time Period	October 2015 Weekday (Pre-Scramble)		August 2016 Weekend (Scramble)		October 2016 Weekday (Scramble)	
		# no walk signal	% no walk signal	# no walk signal	% no walk signal	# no walk signal	% no walk signal
Wilshire Blvd & 2nd Street	AM 7:30-9:30	24	4%	103	26%	41	7%
	PM 5:00-7:00	11	1%	160	8%	90	7%
Wilshire Blvd & 3rd Street	AM 7:30-9:30	8	1%	120	25%	149	20%
	PM 5:00-7:00	12	1%	169	8%	155	12%
Wilshire Blvd & 4th Street	AM 7:30-9:30	26	3%	65	15%	61	7%
	PM 5:00-7:00	10	1%	184	10%	69	6%
Arizona Ave & 2nd Street	AM 7:30-9:30	33	6%	59	26%	71	19%
	PM 5:00-7:00	30	3%	193	8%	84	9%
Arizona Ave & 4th St	AM 7:30-9:30	12	2%	51	20%	47	11%
	PM 5:00-7:00	9	1%	188	7%	115	9%
Santa Monica Blvd & 2nd St	AM 7:30-9:30	30	4%	129	19%	114	16%
	PM 5:00-7:00	27	1%	262	7%	164	9%
Santa Monica Blvd & 4th St	AM 7:30-9:30	4	0%	39	8%	51	6%
	PM 5:00-7:00	9	0%	376	9%	190	9%
Broadway & 2nd St	AM 7:30-9:30	41	5%	126	17%	87	12%
	PM 5:00-7:00	9	0%	307	5%	159	6%
Broadway & 4th St	AM 7:30-9:30	3	0%	38	11%	71	9%
	PM 5:00-7:00	7	0%	155	6%	172	9%
Colorado Ave & Ocean Ave	AM 7:30-9:30	Data Not Available due to construction		80	7%	85	12%
	PM 5:00-7:00	Data Not Available due to construction		916	8%	311	9%
Colorado Ave & 2nd St	AM 7:30-9:30	Data Not Available due to construction		123	19%	83	14%
	PM 5:00-7:00	Data Not Available due to construction		139	2%	69	4%
Colorado Ave & 4th St	AM 7:30-9:30	25	5%	118	19%	471	33%
	PM 5:00-7:00	44	9%	137	3%	377	17%
Average of 12 Intersections	AVG AM 7:30-9:30	21	3%	88	18%	111	14%
	AVG PM 5:00-7:00	17	2%	266	7%	163	9%
	Average	19	2%	177	12%	137	11%

Illegal Crossings – One Way Street



Illegal Crossings – By Marking Type



August 2016 Average Hourly Illegal Crossings				
	X Markings	Full Markings	Colored Artwork	Special Pavement
AVG AM 7:30-9:30	21%	15%	26%	13%
AVG PM 5:00-7:00	8%	4%	8%	8%
AVG 24 Hours	22%	9%	25%	17%

October 2016 Average Hourly Illegal Crossings				
	X Markings	Full Markings	Colored Artwork	Special Pavement
AVG AM 7:30-9:30	11%	20%	19%	11%
AVG PM 5:00-7:00	8%	10%	9%	8%
AVG 24 Hours	26%	20%	32%	21%

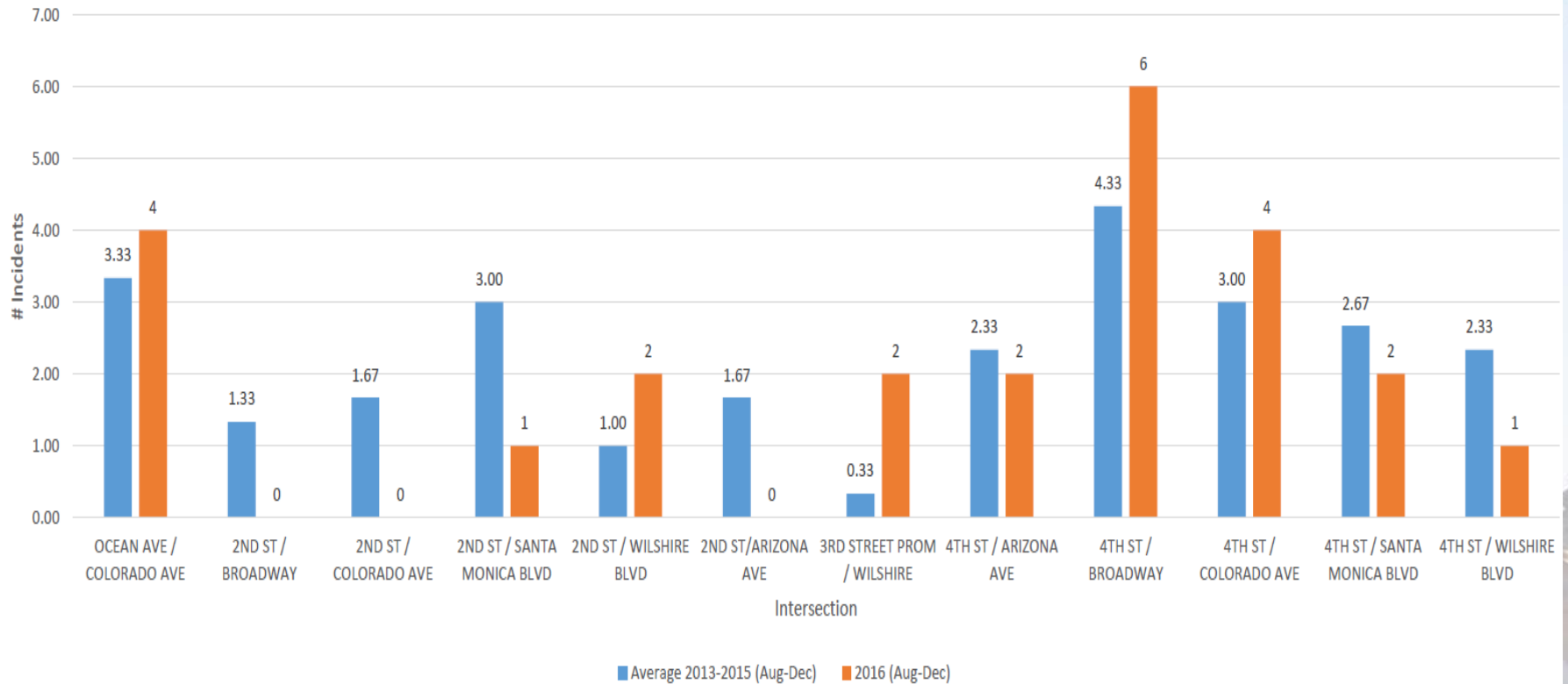
Illegal Crossings - Findings

Time Period	October 2015 Weekday (Pre-Scramble)		August 2016 Weekend (Scramble)		October 2016 Weekday (Scramble)	
	# Illegal	% Illegal	# Illegal	% Illegal	# Illegal	% Illegal
AVG AM 7:30-9:30	21	3%	88	18%	111	14%
AVG PM 5:00-7:00	17	2%	266	7%	163	9%
Average	19	2%	177	12%	137	11%

- ❖ Higher percentage and occurrence of illegal crossings
- ❖ No Variation based on seasons
- ❖ Long learning curve

Incidents – All Traffic Crashes

of traffic incidents (Year Period August-December)
Pedestrian Scramble Locations



Incidents – Ped-Vehicle Crashes

Intersection	2013	2014	2015	2016	Intersection Total
OCEAN AVE / COLORADO AVE	1				1
2ND ST / BROADWAY			1		1
2ND ST / COLORADO AVE					
2ND ST / SANTA MONICA BLVD	1			1	2
2ND ST / WILSHIRE BLVD					
2ND ST/ARIZONA AVE					
3RD STREET PROM / WILSHIRE					
4TH ST / ARIZONA AVE	1				1
4TH ST / BROADWAY	1				1
4TH ST / COLORADO AVE					
4TH ST / SANTA MONICA BLVD			1		1
4TH ST / WILSHIRE BLVD	1				1
Yearly Total	5	0	2	1	8

Incidents - Findings

- ❖ No clear trend - traffic incidents and injuries are similar to previous levels
- ❖ Small sample size of pedestrian-vehicle incidents not enough to identify a direct correlation to the scrambles

Operational Considerations – Wait Time

❖ Wait Time

- Scrambles inherently increase wait times for all users

❖ Incentivizes Jaywalking?

- Increase in illegal crossings likely from long wait time

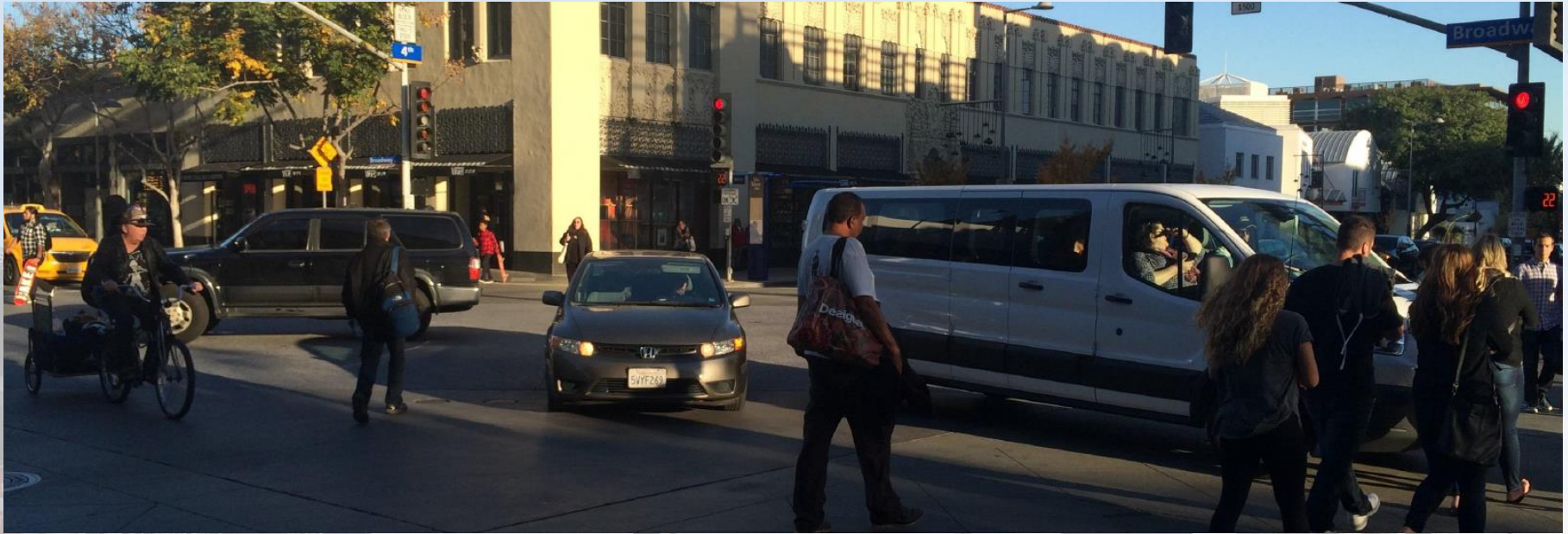


Operational Considerations – Audible PPB

- ❖ Existing Audible PPB at Colorado Ave & Ocean Ave
- ❖ New system installed at Santa Monica Blvd & 2nd St
- ❖ 24 Count data collected in May 2017



Operational Considerations – Permissive Left Turns



❖ Increased all red interval to 2 seconds

Operational Considerations – Right on Red



❖ Keeping Right on Red

Operational Considerations – Audible PPB

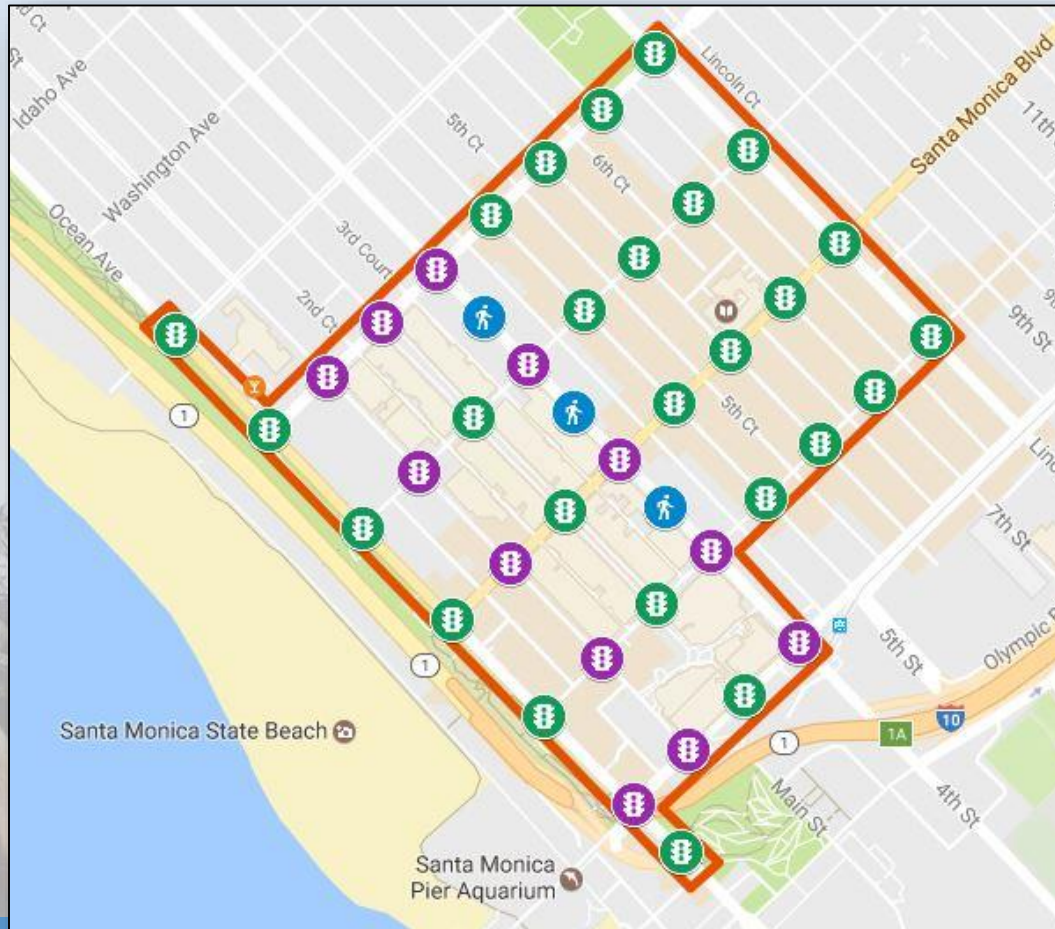
- ❖ Existing Audible PPB at Colorado Ave & Ocean Ave
- ❖ New system installed at Santa Monica Blvd & 2nd St
- ❖ 24 Count data collected in May 2017
- ❖ Overall 10% reduction in illegal crossings



Downtown Traffic Signal Timing Study

- ❖ Phase I – Develop 3 optimized traffic signal timing plans
 - Base plan
 - Inbound plan
 - Outbound plan
- ❖ Phase II -- Implementation and fine tuning of traffic signal timing plans
- ❖ Phase III – Before and after study report

Signal Timing Study Area



Signal Timing Project Approach

Update the existing Synchro model to match current field conditions and add the 12 pedestrian scrambles



Cycle-length analysis and selection using the updated Synchro model



Analyze traffic operations on the roadway network with the selected cycle length and vehicle splits using SimTraffic

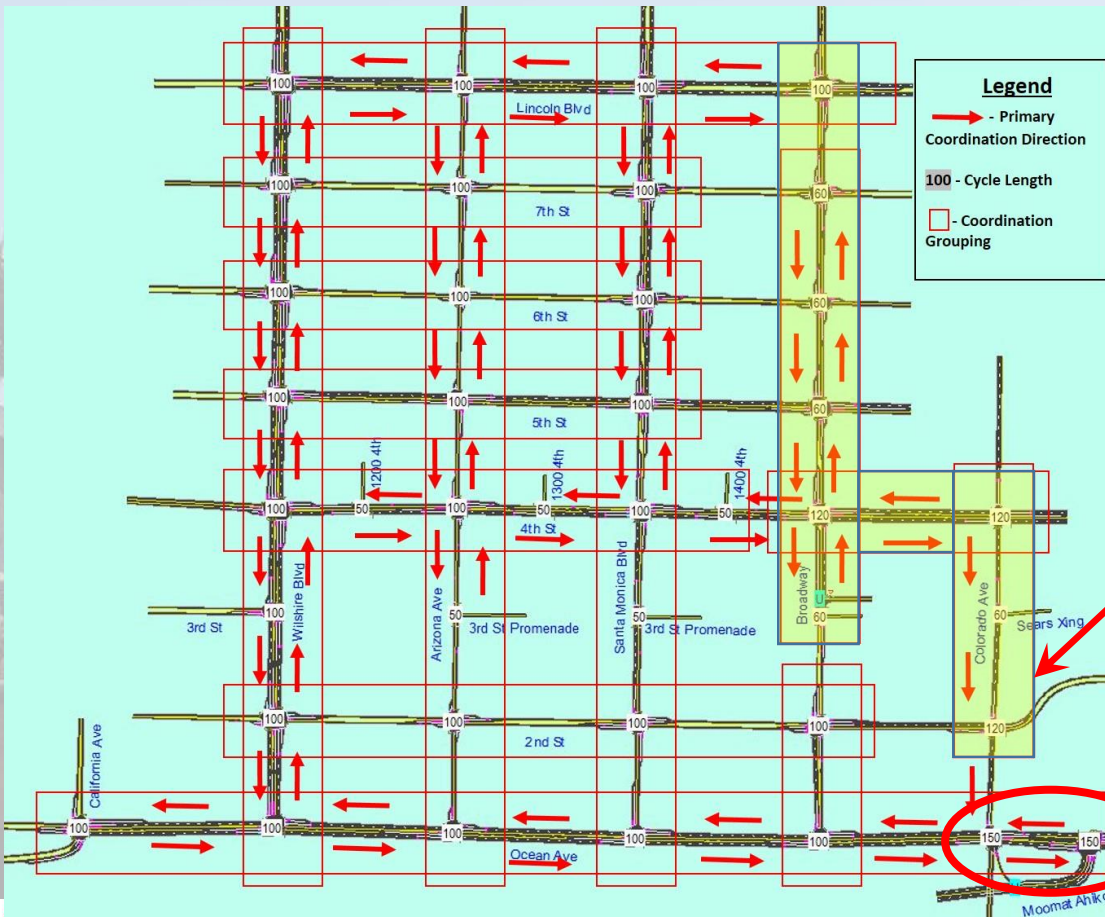


Development of the time-space diagrams with the use of the Tru-Traffic software from imported Synchro model data



Field observation and measurement of system performance to validate the operation predicated by the model

Base Plan – Balanced Flow



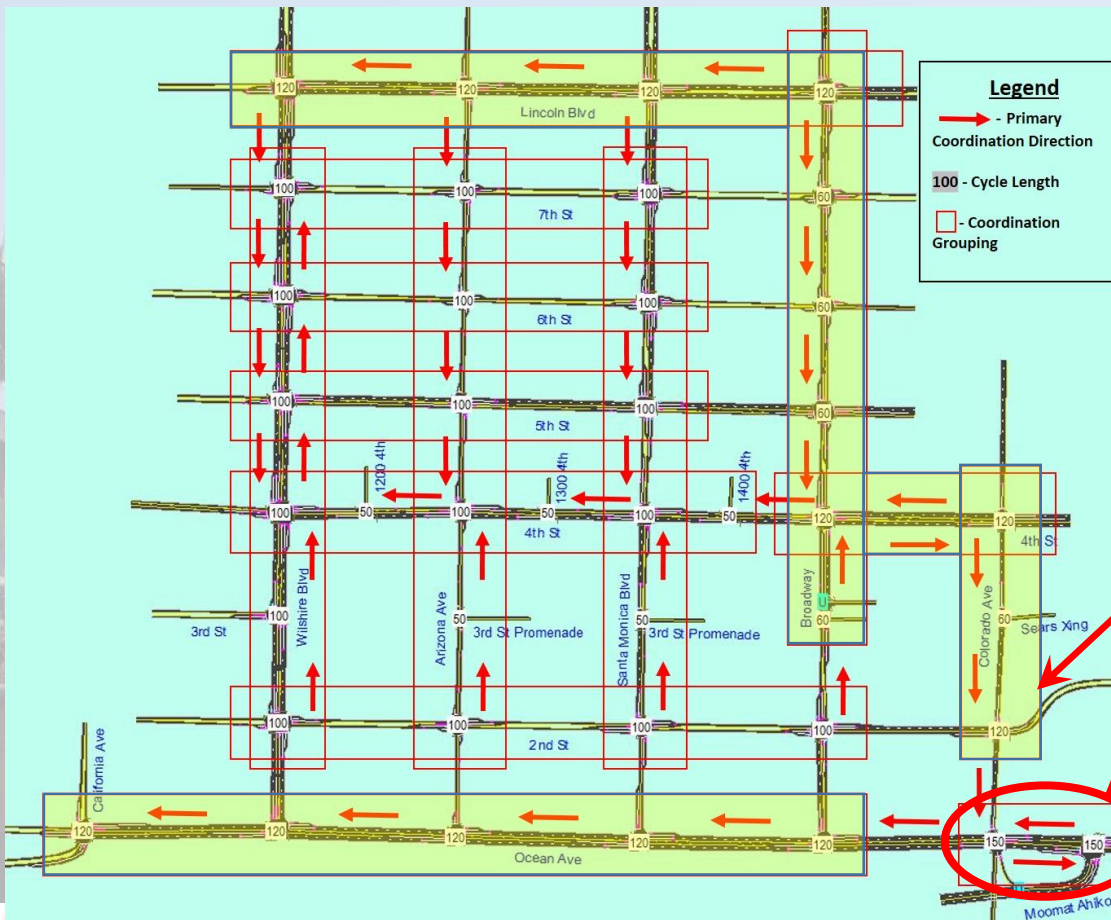
Before:
120 sec / 90 sec

After:
120 sec / 100 sec

120s / 60s Cycle

150s Cycle

Inbound Plan – Directional Flow



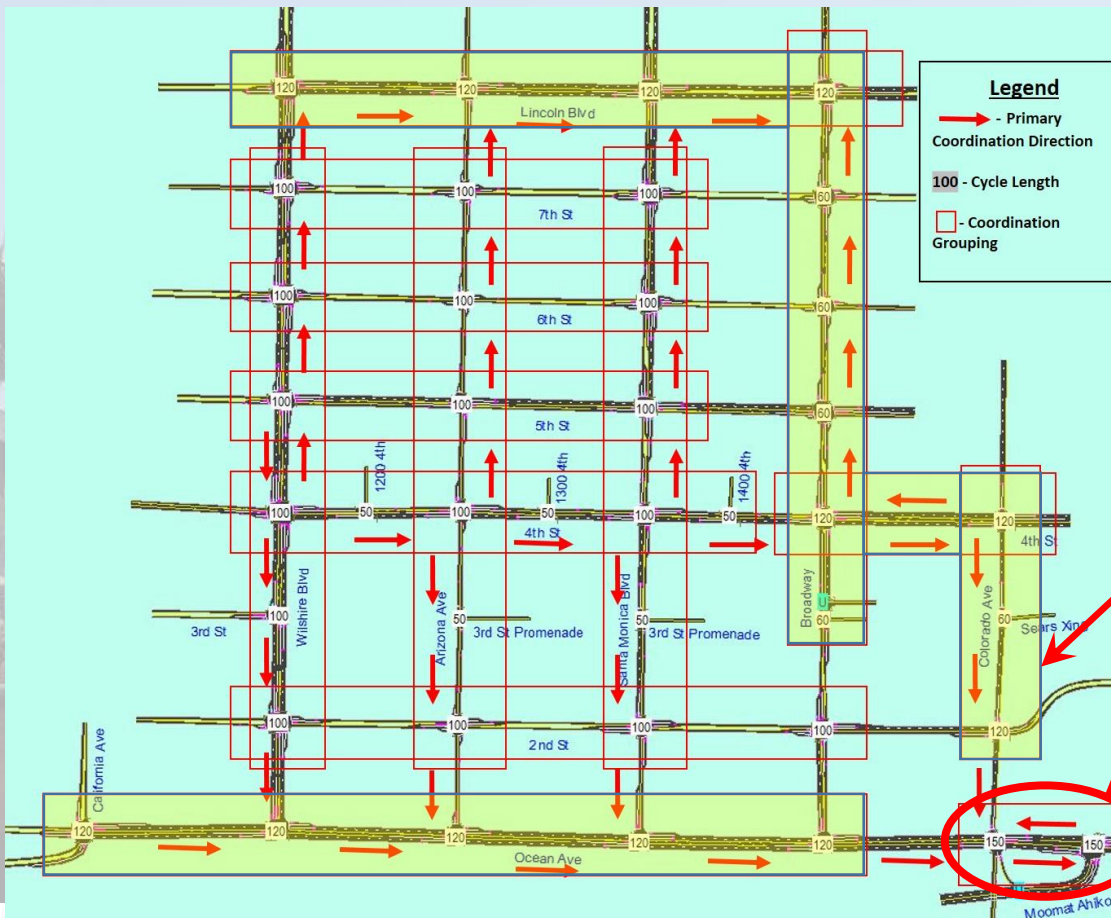
Before:
180 sec / 90 sec

After:
120 sec / 100 sec

120s / 60s Cycle

150s Cycle

Outbound Plan – Directional Flow



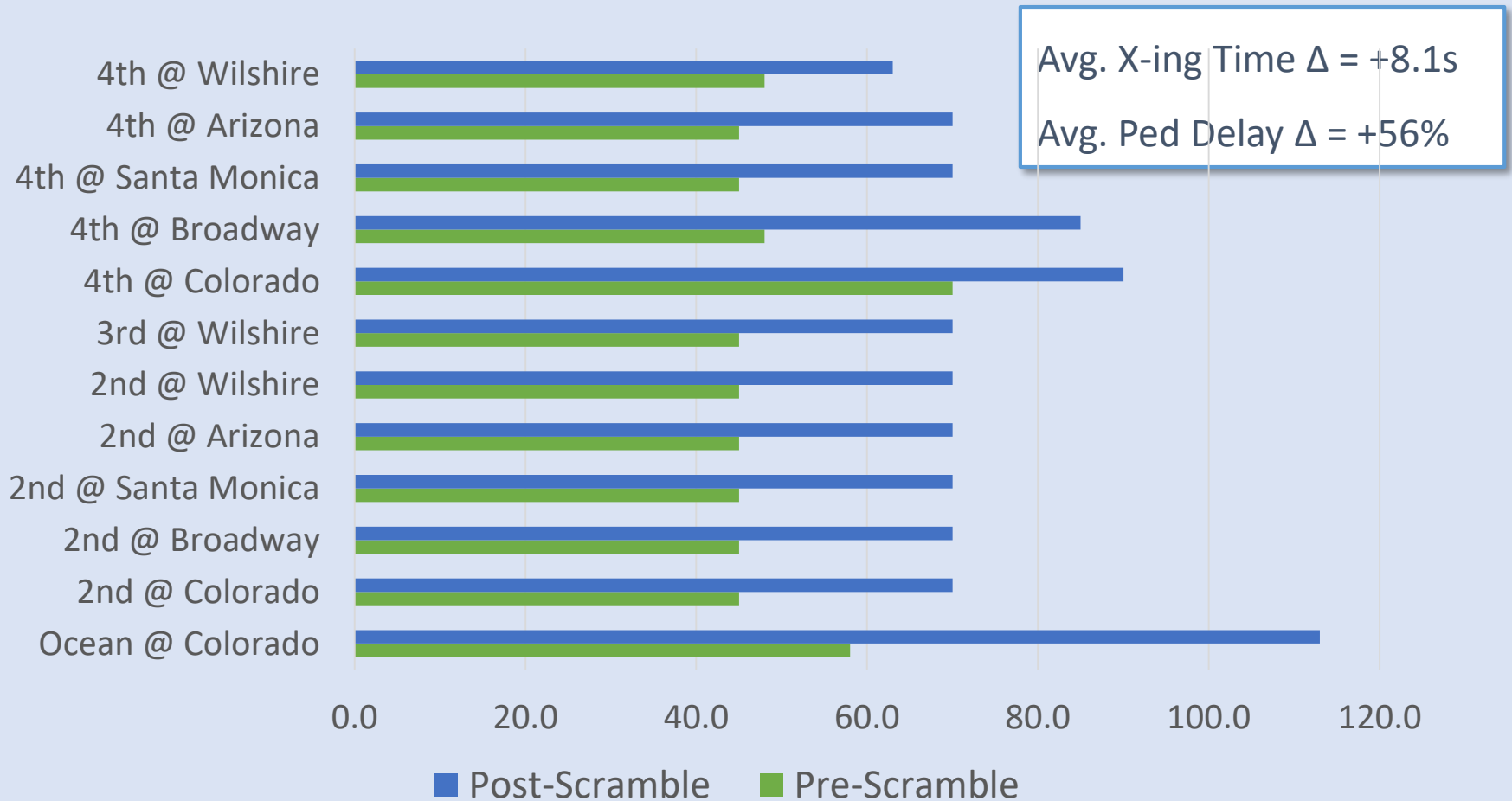
Before:
180 sec / 90 sec

After:
120 sec / 100 sec

120s / 60s Cycle

150s Cycle

Scramble Pedestrian Delay

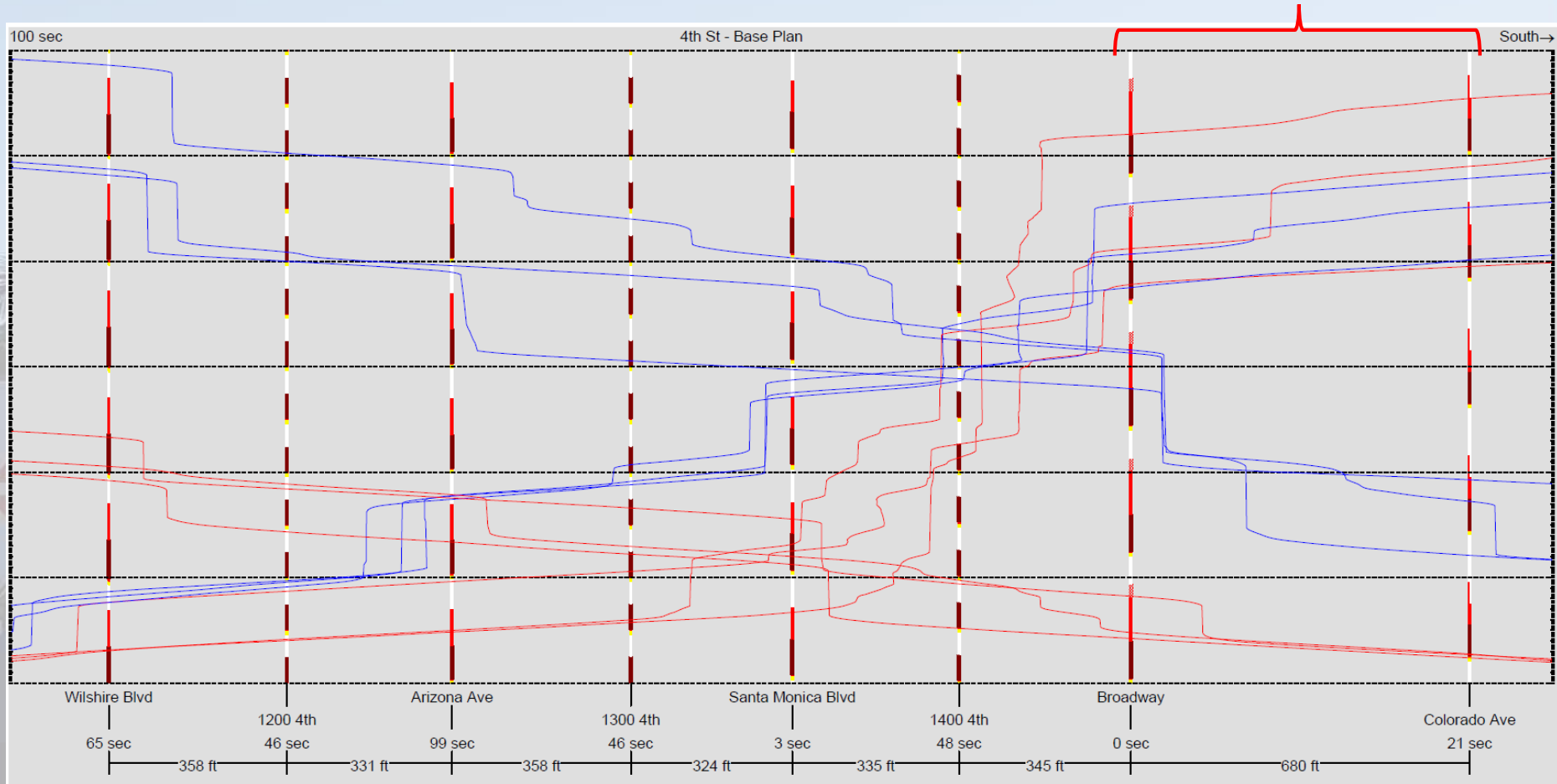


Before / After Results

PM Time Period			Measures of Effectiveness		
Corridor	Direction	Scenario	Travel Time (sec)	Delay (sec)	Number of Stops
Wilshire Blvd Arizona Ave Santa Monica Bl Broadway	EB	Before	876	592	16
		After	881	595	13
		Change	1%	1%	-22%
	WB	Before	1009	723	15
		After	937	657	17
		Change	-7%	-9%	12%
Ocean Ave 2 nd St 4 th St 5 th St 6 th St 7 th St Lincoln BL	NB	Before	993	553	13
		After	1283	842	15
		Change	29.2%	52.3%	15.0%
	SB	Before	1684	1243	18
		After	1393	953	17
		Change	-17.3%	-23.3%	-5.7%
Total			-1.5%	-2.1%	-1.3%

4th Street Travel-Time Data

120 sec.



Signal Timing Study Findings

- ❖ Higher delay for pedestrian and other modes
- ❖ Vehicle flow tradeoff for safety with 'Pedestrian First' Downtown
- ❖ Locations with more than two phases are a bottle neck
- ❖ Happy cycle length only went from 90 to 100 for majority of grid
- ❖ Data shows some improvements and some extra delay . . . City still OK with results

Project Summary

- ❖ Safety and place making were driving forces
- ❖ Long learning curve
- ❖ Not consistent from a striping standpoint due to existing intersection treatments
 - Consistency would help
 - Initial data does not show less compliance at non-striped locations
- ❖ Right-turn-on red working OK
- ❖ Scrambles probably not needed at all 12 locations ...
Choose wisely

Questions?

